

RINSE-OFF FACIAL WASH COMPOSITIONS DELIVERING ENHANCED  
WHITENING USING SUBMICRON TITANIUM OXIDE, OPTIONAL MODIFIER  
AND DEPOSITION SYSTEM

FIELD OF THE INVENTION

The present invention relates to rinse-off cleanser compositions delivering immediate skin whitening effect. This is accomplished by using sub-micron titanium dioxide, preferably together with optical modifier (e.g., micron size mica or talc or emollient oil) from facial cleanser base. Generally, the enhancement is obtained by use of specific deposition system (e.g., cationic polymer/ anionic surfactant precipitates) and/or by ensuring dispersion of particles (e.g., little or no agglomeration) onto skin or deposited substrate.

## BACKGROUND

It is extremely difficult to deliver enhanced whitening, especially rapid whitening, from a rinse-off composition. The optical modifiers delivering these properties are not readily deposited, are readily rinsed off and, because they readily agglomerate, are not in a sufficiently dispersed state to be efficiently delivered to substrate (which is another way to say that they rinse off too easily).

Applicants' co-pending U.S. Serial No. 10/241,401 to Zhang et.al., filed September 11, 2002 discloses personal care formulations comprising particles of defined refractive index, thickness, geometry and size. While this disclosure relates to how size, shape, etc. of the particles themselves help deposition (and thus shine), it fails to disclose specific deposition enhancement systems (e.g. based on type of surfactant and/or polymers), and the use of dispersed, sub-micron TiO<sub>2</sub> (preferably with other optical modifiers) to deliver enhanced whiteness. It also does not disclose how particles must be adequately dispersed on substrate (e.g., skin) to deliver defined change values needed to perceive measure optical traits.

U.S. Serial No. 10/443,396 to Zhang et al., filed May 23, 2003 discloses structured benefit agent for enhanced delivery of optical modifier, but again does not disclose combination of sub-micron titanium dioxide, cationic deposition polymers (forming precipitates as deposition aid) and adequate dispersal to deliver enhanced whiteness.

## BRIEF SUMMARY OF THE INVENTION

Unexpectedly, applicants have now found both compositions and ways to manipulate such compositions to provide enhanced whitening from rinse-off systems. That is, using deposition enhancement systems (e.g., characterized, for example, by precipitates formed through interaction of polymers and surfactants), modifiers associated with specified optical properties (e.g., sub-micron titanium dioxide for whiteness), can be dispersed and delivered to provide desired optical whiteness (i.e., by providing sufficient change in absolute or percentage values of the whitening component to result in perceived whitening changes). Changes in optical attributes previously unobtainable from wash-off/rinse-off systems are provided by selecting the specified components.

More particularly, the invention comprises as follows:

Beauty wash product compositions for delivery of enhanced (changed) whitening or brightening to the skin comprising:

- a) from about 0.5% to about 90%, preferably 5 to 75% more preferably 10 to 75%, most preferably 20% to 70% by weight surfactant selected from anionic, nonionic, amphoteric and cationic surfactants and mixtures thereof.
- b) from 0 to 35%, preferably 0.2 to 25% by weight of solid particulate optical modifier which exhibits a specific set of optical properties (e.g., defining radiance or shine ( $\Delta$  gloss), whiteness ( $\Delta L$ ), degree of red or greenness ( $\Delta a^*$ ), degree of yellow or blueness ( $\Delta b^*$ ), change in opacity) and which, in combination with a deposition enhancement system, provides at least 5% improvement (i.e., 5% change) in at least one visual attribute being targeted (e.g., shine, color), wherein values reflecting various optical properties are measured before or after conducting tests according to a defined protocol, when said composition is applied to the skin;

- c) from 0.01% to 30%, preferably 0.1 to 25% by wt. of titanium dioxide particles having size of about 100 nm to 300 nm
- d) from 0.1 to 25% by wt. of a deposition enhancement system, wherein, the deposition enhancement system enhances delivery to the skin of a target or defined visual attribute (i.e., whitening) by the optical modifier relative to a composition that has the same surfactant and optical modifier used at the same concentration but does not have the deposition enhancement system; and
- e) from about 0.1% to 45% of a hydrophilic structural dispersant (e.g., polyalkalene glycol).

The enhanced whiteness may be measured by a change in L value (measure of whiteness) of at least 5% in absolute or per cent terms.

These and other aspects, features and advantages will become apparent to those of ordinary skill in the art from a reading of the following detailed description and the appended claims. For the avoidance of doubt, any feature of one aspect of the present invention may be utilized in any other aspect of the invention. It is noted that the examples given in the description below are intended to clarify the invention and are not intended to limit the invention to those examples per se. Other than in the experimental examples, or where otherwise indicated, all numbers expressing quantities of ingredients or reaction conditions used herein are to be understood as modified in all instances by the term "about". Similarly, all percentages are weight/weight percentages of the total composition unless otherwise indicated. Numerical ranges expressed in the format "from x to y" are understood to include x and y. When for a specific feature multiple preferred ranges are described in the format "from x to y" it is understood that all ranges combining the different endpoints are also contemplated. Where the term "comprising" is used in the specification or claims, it is not intended to exclude any terms, steps or features not specifically recited. All temperatures are in degrees Celsius (°C) unless specified otherwise. All measurements are in SI units unless

specified otherwise. All documents cited are – in relevant part – incorporated herein by reference.

## DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to composition and to methods of delivering enhancement in delivery of whiteness from rinse-off compositions. Specifically, by using sub-micron titanium dioxide, preferably together with other optical modifiers, and specific deposition enhancement systems, a targeted value can be manipulated to deliver desired whiteness.

Specifically, the rinse-off compositions of the invention comprise:

- a) 0.5% to 90%, preferably 5% to 75%, more preferably 10% to 75% by wt. of a lathering surfactant (By lathering is meant the composition will have foam of at least 30 cc in a lather wash test);
- b) 0% to 35%, preferably 0.2% to 25% by wt. of a solid particulate optical modifier enhancing a specific set of properties (e.g. whiteness) and which, in combination with deposition enhancement system for the modifier (e.g. precipitate formed from interaction of polymer and surfactant) provides at least 5% change in at least one targeted visual attribute, wherein said change is defined by increase or decrease in absolute or percentage value characterizing a specific trait (i.e.,  $\Delta$  gloss is associated with radiance or  $\Delta L$  with whiteness) and evaluation is made after using a defined in vitro skin protocol test;
- c) from 0.01% to 30% by wt. titanium dioxide particles having size of 100 to 300 nm;
- d) from 0.1 to 25% by wt. of said deposition enhancement system wherein, said system (c) is defined by its ability to enhance delivery of said targeted visual attribute, by the modifier relative to composition with some

surfactant and modifier at same concentration, but which does not have the deposition enhancement system, and

- e) from 0.1 to 45% by wt. of a hydrophilic structural dispersant

Surfactant is present at a level of 0.5 to 90%, preferably 5 to 75%, more preferably 10-75%, even more preferably 20% to 70% by wt. of composition, depending on product form.

In general, as noted, the surfactant may be selected from the group consisting of soap (including pure soap systems), anionic surfactant, nonionic surfactant, amphoteric/zwitterionic surfactant, cationic surfactant and mixtures thereof.

"Soap" is used in the popular sense i.e., alkali metal or alkanol ammonium salts of aliphatic, alkane or alkene monocarboxylic acids. Other surfactants which may be used are described in "Surface Active Agents and Detergents" (Vol. I & II) by Schwartz, Perry & Berch, a copy of which is incorporated by reference into the subject application.

As indicated, the particulate optical modifier (titanium dioxide plus optional other modifier) should provide, in combination with deposition enhancement system, at least a 5% change in L value associated with lightening.

Specifically, improvement is measured by taking a value for a particular measured component (e.g., L value for whitening) and measuring (e.g., using in vitro pig assay) values of the components before and after application of particle deposition enhancement system.

The optical benefit carried by the deposition of optical modifier can be targeted to either plateaus on the skin surface or to skin crevices.

In one embodiment, the formulation deposition of TiO<sub>2</sub> and optional modifier creates skin lightening, whitening, and/or color or similar attributes and the composition deposits sub-micron TiO<sub>2</sub> and optional particulate optical modifier to exhibit ΔL value in the range of ±10 L units. Δa\* values may be in the range from about 0 to about ±10, Δb\* value may be in range from about 0 to about ±10, and a change in opacity may be in the range from about 0 to about ±50%. The reflectance should be within normal skin reflectancy range. In this case, this means change in reflectance is ≤10 %. Although there may be a focus on Δa\* and Δb\* values (since there is a focus on general color attributes), it is important L value (associated with whitening) be changed at least 5%.

#### OPTICAL MODIFIER

The optional optical modifier which may be used for the subject invention may be chosen from non-colored and colored, organic and inorganic materials.

Among the materials which may be used are included:

Organic pigments, inorganic pigments, polymers and fillers such as titanium oxide, zinc oxide, colored iron oxide, chromium oxide/hydroxide/hydrate, alumina, silica, zirconia, barium sulfate, silicates, natural/alkaloid (including derivatives) polymers, polyethylene, polypropylene, nylon, ultramarine, alkaline earth carbonates. The materials can be platy materials such as talc, sericite, mica, synthetic mica, platy substrate coated with organic and inorganic molecules, bismuth oxychloride, barium sulfate. Particle can be composed of several materials (like dyes, lakes, toners). Lakes are, for example, dyes with aluminum hydroxide to help bind to solid. Color can be generated through fluorescence, absorption or iridescence. That is, color of modifier materials is generated through optical means rather than, for example, chemical means.

The optical modifier may also be a UV screen material with a  $D_{50} < 100$  nanometers (where  $D_{50}$  means size of 50% of particles or less is  $< 100 \text{ nm}$ .

The optical modifiers may also be defined by their physical properties. For example, the optical modifier may be broadly defined as follows:

- i) an exterior surface having a refractive index of 1.3 to 4.0
- ii) a geometry which is spheroidal, platy or cylindrical
- iii) dimensions: spheroidal – 0.1 to 200  $\mu\text{m}$ , platy – 1 to 200  $\mu\text{m}$ , cylindrical – 1 to 200  $\mu\text{m}$  in length and 0.5 to 5.0  $\mu\text{m}$  in diameter
- iv) a  $D_{50}$  of  $\leq 200$  microns in particle size.
- v) may have fluorescence color, absorption color and/or interference color (color through optics)

More specifically particles providing change in shine/glow/radiance may be defined as follows:

- i) an exterior surface having a refractive index of 1.8 to 4.0,
- ii) a geometry which is platy or cylindrical,
- iii) dimensions: spheroidal – 0.1 to 200  $\mu\text{m}$  (microns), platy – 10 to 200  $\mu\text{m}$ , cylindrical – 10 to 200  $\mu\text{m}$  in length and 0.5 to 5.0  $\mu\text{m}$  in diameter, and
- iv) a  $D_{50}$  of  $\leq 200 \mu\text{m}$  in particle size.

Particle providing skin lightening/color may be defined as follows:

- i) an exterior surface having a refractive index of 1.3 to 4.0,
- ii) a geometry which is spheroidal or platy,
- iii) dimensions: spheroidal – 0.1 to 1  $\mu\text{m}$  microns, platy – 1 to 30  $\mu\text{m}$ ,
- iv) a  $D_{50}$  of  $\leq 300 \mu\text{m}$  in particle size, and

- v) may have fluorescence color, absorption color and/or interference color (color through optics).

Particle-producing evenness or soft focus may be defined as follows:

- i) an exterior surface having a refractive index of 1.3 to 2.0,
- ii) a geometry which is spheroidal, platy or cylindrical,
- iii) dimensions: spheroidal – 0.1 to 200  $\mu\text{m}$ , platy – 1 to 10  $\mu\text{m}$ , cylindrical -1 to 10  $\mu\text{m}$  in length and 0.5 to 5.0  $\mu\text{m}$  in diameter, and
- iv) a D<sub>50</sub> of  $\leq 200 \mu\text{m}$  in particle size.

Of course, the formulation can contain a mixture of particles, each containing characteristics of a specific visual benefit, to create a combination of visual effects.

It is also to be understood that for visual effects/attributes to have maximum effect, the particles have to be well dispersed on the skin and should also give minimal to no sensory negatives.

By being “well dispersed” is meant that the particles should not agglomerate and that they should be spread easily through the skin surface.

In a preferred embodiment, less than 30% of particles TiO<sub>2</sub> and other optical modifiers are agglomerates having a size of ten times or more than the particle size. This can be measured using optical or electron microscopy.

The particle is used at about 0% to 35% by weight preferably 0.2 to 25% by wt., of the composition.

## TITANIUM DIOXIDE

Compositions of the invention require use of titanium dioxide wherein particle size is sub-micron. Specifically, particle must be in the range 100 to 300 microns, preferably 120 to 300 nanometers.

The TiO<sub>2</sub> should be used at level of from about 0.01 to 30% preferably to 0.1 to 25% by wt.

## DEPOSITION ENHANCEMENT

The deposition enhancement is key to the delivery of titanium dioxide and optional particles providing enhanced visual benefit (e.g., as defined in changes in ΔL, Δa\*, etc. and in methods to manipulate the values to provide the desired benefit, e.g. radiance, color, etc.).

In one embodiment, the deposition is provided by a deposition system comprising as follows:

- a) from about 0.1 to about 10% by wt., preferably 0.1 to 8% by wt. of a cationic polymer having change density  $\geq 1\text{ Meq/gram}$ , and
- b) about 0.1 to 30% by wt., preferably 0.5% to 25% by wt. of an anionic surfactant which forms a precipitate with cationic polymer upon dilution.

The precipitate formed can be a floc which can be broken up upon shear or rubbing to form a uniform and dispersed film on the surface of the skin.

Example of such surfactants include C<sub>10</sub> - C<sub>24</sub> fatty acid soaps (e.g., laurates), alkyl taurate (e.g., cocoyl methyl taurate or other alkyl taurates), sulfosuccinates, alkyl sulfates, glycinate, sarcosinates and mixtures thereof.

It is important that the cationic have the noted charge in order to form the precipitate which is a key to the deposition of optical modifiers delivering the desired optical attributes. The polymers may be modified polysaccharides including cationic guar gums, synthetic cationic polymers, cationic starches, etc.

Specific cationic polymers which are to be used include Merquat® polymers such as polyquaternium 6 (e.g., Merquat®100 or Salcare®SC30) and polyquatrnum7 (e.g. Merquat®2200 or Salcare®SC10); guar gums and/or derivatives (e.g. Jaguar CI7); quaternized vinylpyrrolidone/methacrylate copolymers (e.g., Gafquat® 775); and polyquaternium-16 (e.g.; Luviquat®FC550)

In general, other deposition aids (e.g., for the TiO<sub>2</sub> and optional optical modifier particles) may include granular anionic polymers (e.g. alkaloid polymer such as starch, cellulose or their derivatives). That is if the deposition system additionally comprises such deposition aid, results are further enhanced.

Yet, another way to enhance deposition may be through modification (e.g. surface modification) of particles.

In another embodiment, the deposition enhancement system may comprise:

- 1) from 0.1 to 10% by wt. of an anionic polymer having charge density of at least  $\geq 1.0$  Meq/gram; and
- 2) from about 0.1 to 30% cationic surfactant which forms a precipitate with the anionic polymer upon dilution.

This system is the inverse of cationic polymer anionic surfactant system. The precipitate can also be a floc which can be broken up on shear or rubbing and form a uniform and dispersed film on the skin surface.

Cationic surfactant may be a quaternary amino surfactant or an amphoteric such as betaine (e.g., cocoamidopropyl betaine).

The anionic polymer may be a polyacrylate, cross-linked polyacrylate, polyurethane and/or alkaloid derived polymer (e.g., starch, cellulose and derivatives), polysaccharide (e.g. xanthan gum), agar and/or mixtures thereof.

This system may also additionally comprise 0.1 to 30% granular anionic polymer which is natural alkaloid polymer (starch, cellulose and derivatives) as deposition aid.

## EXAMPLES

### Protocol

#### In Vitro Porcine/Pig Skin Assay

A piece of black porcine skin is used ( $L = 40 \pm 3$ ), where skin has dimensions of 5.0 cm by 10 cm, and the skin is mounted on black background paper card. Initial measurements of untreated skin are made. The mounted skin is then washed and rinsed with 0.2 g of liquid wash-off formulation or soap bar. After two (2) hours of drying, final measurements are made.

#### Color Measurements

Initial and final color measurements were made of porcine or in-vivo human skin using a Hunter Lab spectra colormeter using a  $0^\circ$  light source and  $45^\circ$  detector geometry. The spectra colormeter was calibrated with the appropriately black and white standards. Measurements were made before and after wash treatment. Three measurements were made each time and averaged. Values of L, a\*, and b\*, which came from the L a\* b\* color space representation, were obtained in this manner. L

measures units of "Lightness",  $a^*$  measures values from red to green and  $b^*$  measures values from yellow to blue.

#### Reflectance (Gloss) Determination

Initial and final reflectance/radiance measurements of porcine or in-vivo human skin was made with a glossmeter which measures units of gloss. The glossmeter was first set with both detector and light source at 85° from normal. The glossmeter was calibrated with appropriate reflection standard. Measurements of gloss were taken before and after application of formulation and  $\Delta$  gloss was calculated to obtain percent difference.

#### Opacity Determination

Opacity of washable deposition was calculated from Hunter Lab color measurements. Opacity contrast was calculated from  $\Delta L$  (change in whiteness after deposition compared to prior to deposition) divided by 60 (which is the difference in L value of skin and a pure white color).

### EXAMPLES 1 – 5

The following compositions show changes in value (i.e.  $\Delta$  gloss (%),  $\Delta L$ ,  $\Delta a^*$ ,  $\Delta b^*$ , as seen at bottom of chart) when surfactant and deposition systems are used relative to compositions either without same ingredients and/or with different or no deposition systems.

### Pigment-Containing Compositions

Component	Ex. 1	Ex. 2	Ex. 3	Ex. 4	Ex. 5		
Lauric/Myristic/Palmitic/ Stearic acid (fatty acids)	3.27/5.37/7.12/6.24/3.91 KOH						
Sodium N-cocoyl N-methyl taurate (30%) (surfactant)	6.0						
20EOcetyl ether/dipropylene glycol/glycerin/maltitol solution(75%) (sensory)	4/8.8/12/4						
Dibutylhydroxytoluene/EDTA	0.05/0.05						
Jaguar C13S (Cationic Polymer)	0.4	0.4	0.4	0.4	0.4		
Titanium Dioxide (Kronos 2071-U, 0.3 to 0.5 um)	20	10	10	10	10		
Metal soap treated Talc (J68MT, < 10 um, US cosmetic Corporation)	-	-	5	-	-		
Mica (TiO <sub>2</sub> coated mica, <15 um, Timiron MP1005 from Rona)	-	-	-	5	-		
Mica22 (22 um, Cardre Inc.)	-	-	-	-	5		
Petrolatum	-	-	-	-	-		
Neosil CP10 (Crossfield, silica gel 50 to 200 um as exfoliate )	-	-	-	-	-		
Perfume	0.25	0.25	0.25	0.25	0.25		
Deionized water	To 100	To 100	To 100	To 100	To 100		
<u>Pig Skin invivo</u>							
<b>Δ gloss (%)</b>	<b>-39.8</b>	<b>-20.8</b>	<b>0</b>	<b>16.6</b>	<b>34.3</b>		
<b>Δ L</b>	<b>19.3</b>	<b>7.6</b>	<b>7.9</b>	<b>7.8</b>	<b>14.5</b>		
<b>Δ a*</b>	<b>-0.7</b>	<b>-0.5</b>	<b>-0.3</b>	<b>-0.1</b>	<b>-1.5</b>		
<b>Δ b*</b>	<b>-8.3</b>	<b>-5.7</b>	<b>-6.7</b>	<b>-7.5</b>	<b>-6.7</b>		

For top 4 rows, same ratios used for all 5 examples.

As seen from the Table above, systems of the invention create optical attributes ( $\Delta L$ ,  $\Delta a^*$ , etc.) which vary in change of the value (and accordingly with the attribute which is highlighted) depending on exact particle, size of particle, and deposition system used. Thus, applicants are able to manipulate values from a wash-off system; and to provide values and the ability to manipulate previously unknown.

A more detailed discussion of observations which can be made from the many examples is set forth below:

Examples 1 to 5, are Jaguar C13S based formulations, which show some deposition.

Examples 1 and 2 have 20% TiO<sub>2</sub> and 10% TiO<sub>2</sub>, respectively, with the 20% TiO<sub>2</sub> formulation showing higher deposition and larger  $\Delta L$  change. There is also a large (and negative) change in the  $b^*$  value (becoming bluer). The deposition also has a matting visual effect as can be seen from the negative  $\Delta$ gloss (which indicates a lowering of shine).

Examples 3 to 5 use Example 2 formulation with an addition of a reflective particle material.

Example 3 has talc ( $D_{50}$  of 10um) included into the formulation. The slight reflectivity of talc counteracts the matting effect of the deposited TiO<sub>2</sub>, as can be seen by the zero change in  $\Delta$ gloss. This combination gives a whiter, lighter appearance while still maintaining the skin's normal shine. The addition of the talc did not alter the  $\Delta L$  or  $\Delta b^*$  seen from Example 2.

Example 5 is the same as Example 3 except that natural mica ( $D_{50}$  of 22 um) is used. The higher reflectivity of the larger sized mica counteracts the matting effect of the deposited TiO<sub>2</sub> and increases the visual shine, as can be seen by the increase in  $\Delta$ gloss. The addition of the natural mica did not alter the  $\Delta L$  or  $\Delta b^*$  seen from Example 2.

Example 4 is the same as Example 3 except that a titan coated mica ( $D_{50}$  of 6um) is used. The greater reflectivity of the titan-coated mica counteracts the matting effect of the deposited TiO<sub>2</sub> and increases the visual shine, as can be seen by the

increase in  $\Delta$ gloss. The addition of the coated mica does increase the  $\Delta L$  or  $\Delta b^*$  as compared to Example 2.

The control is for comparison purposes. It has the same formulation as Example 2 except there is no cationic polymer (Jaguar C13S). From the L,  $a^*$ ,  $b^*$ , and gloss values, no deposition is observed.

From Examples 1 to 5, changes in visual attributes can be seen but they are not large enough. The particle deposition needs to be larger. For this to occur, a cationic polymer with a larger charge density must be used (in this case Merquat 100).

Example 6 is the same as Example 2, except the cationic polymer used is Merquat 100. As can be seen from the  $\Delta L$  and  $\Delta$ gloss, the deposition of the TiO<sub>2</sub> is much greater (by a factor of 5). The visual effect is a much greater whiteness but also a larger increase in mattness. To counteract the mattness, natural mica or talc can be added to the formulations.

Examples 7 and 8 are Merquat 100 formulations with natural mica or talc. Both examples show an attenuation in the matting effect of the large TiO<sub>2</sub> deposition as can be seen by the lower negative or even positive  $\Delta$ gloss.

### Starch Structuring

The facial wash-off formulation can also use a different hydrophilic structural dispersent, such as starch. Similar correlations and trends can be seen with the starch formulation system as with the previous examples.

Example 12 and Example 11 compare the deposition of TiO<sub>2</sub>/talc from formulations using Jaguar C13S and Merquat 100, respectively. As before, the higher charge density Merquat shows greater deposition than Jaguar, with similar visual attributes.

Example 9 is a control formulation, with no cationic polymer. From the L, a\*, b\*, and gloss measurements, there is little to no deposition.

Example 10 shows the importance of compatibility of surfactant systems to deposition efficiency. Example 10 uses a mixture of CAP Betaine and LE(2)S. In comparison with Example 11, the deposition is less efficient as seen from the lower  $\Delta L$  values. This is an indication that the CAP Betaine/LE(2)S surfactant system is not as effective precipitating cationic polymer upon dilution.

### Example 6

The chart below provides additional examples.

**Pigment-Containing Compositions**

Component	Ex. 8
Lauric acid	3.27
Myristic acid	5.37
Palmitic acid	7.12
Stearic acid	6.24
Potassium hydroxide	3.91
Sodium N-cocoyl N-methyl taurate (30%)	6.0
Polyoxyethylene cetylether(20E.O.)	4
Dipropylene glycol	8.8
Glycerin, concentrated	12
Sorbitol	-
Maltitol solution (75%)	4
Dibutylhydroxytoluene	0.05
EDTA tetrasodium tetrahydrate	0.05
Jaguar C13S (Cationic Polymer)	-
Merquat 100 (Cationic Polymer)	0.4
Titanium Dioxide (0.3 to 0.5 um)	10
UV TiO2 (Treated)	-
UV TiO2 (M212, Presperse)	-
Petrolatum	
Perfume	0.25
Deionized water	To 100
Pig skin in-vitro	
Δ gloss (%)	-50.0
Δ L	34.6
Δ a*	-2.4
Δ b*	-8.6

Again, it can be seen from the above chart how deposition system and particles of invention provide compositions with desired values providing desired optical attributes (e.g., radiance, color, shine).

## Control

The chart below provides additional examples.

Component	Control
Lauric acid	3.27
Myristic acid	5.37
Palmitic acid	7.12
Stearic acid	6.24
Potassium hydroxide	3.91
Sodium N-cocoyl N-methyl taurate (30%)	6.0
Polyoxyethylene cetylether(20E.O.)	4
Dipropylene glycol	8.8
Glycerin, concentrated	12
Maltitol solution (75%)	4
Dibutylhydroxytoluene	0.05
EDTA tetrasodium tetrahydrate	0.05
Jaguar C13S	0
Polymer JR	
Merquat 100	-
Titanium Dioxide (0.3 to 0.5 um)	10
Timiron Super blue	-
Petrolatum	-
Perfume	0.25
Deionized water	To 100
Pig skin in-vitro	
<b>Δ gloss (%)</b>	<b>-3.9</b>
<b>Δ L</b>	<b>0.1</b>
<b>Δ a*</b>	<b>0.1</b>
<b>Δ b*</b>	<b>0.1</b>

Again it can be seen from the above control that when there is no cationic, there is little or no deposition.

### Example 7

The chart below again shows different variations.

**Pigment-Containing Compositions**

Component	Ex. 7
Lauric acid	3.27
Myristic acid	5.37
Palmitic acid	7.12
Stearic acid	6.24
Potassium hydroxide	3.91
Sodium N-cocoyl N-methyl taurate (30%)	6.0
Polyoxyethylene cetyl ether(20E.O.)	4
Dipropylene glycol	8.8
Glycerin, concentrated	12
Maltitol solution (75%)	4
Dibutylhydroxytoluene	0.05
EDTA tetrasodium tetrahydrate	0.05
Jaguar C13S	-
Merquat 100	0.8
Titanium Dioxide (PW liquid TiO <sub>2</sub> , 0.3 um)	10
UV TiO <sub>2</sub> (M212)	-
Mica (TiO <sub>2</sub> coated mica, <50 um, Timiron super blue from Rona)	-
Mica22 (22 um, Cardre Inc.)	5
Petrolatum	-
Perfume	0.25
Deionized Water	To 100
Pig skin in-vitro	
<b>Δ gloss (%)</b>	<b>20.0</b>
<b>L</b>	<b>33.03</b>
<b>A*</b>	<b>-3.8</b>
<b>B*</b>	<b>-9.55</b>

### Examples 8

The chart below shows one more example.

Component	Ex. 8
Lauric acid	3.27
Myristic acid	5.37
Palmitic acid	7.12
Stearic acid	6.24
Potassium hydroxide	3.91
Sodium N-cocoyl N-methyl taurate (30%)	6.0
Polyoxyethylene cetylether(20E.O.)	4
Dipropylene glycol	8.8
Glycerin, concentrated	12
Maltitol solution (75%)	4
Dibutylhydroxytoluene	0.05
EDTA tetrasodium tetrahydrate	0.05
Merquat 100	0.4
Titanium Dioxide	10
Soft Talc	5
DI Water	To 100
Petrolatum	10
Perfume	0.25
DI water	To 100
Pig skin in-vitro	
<b>Δ gloss (%)</b>	<b>-5.6</b>
<b>L</b>	<b>31.3</b>
<b>A*</b>	<b>-3.6</b>
<b>B*</b>	<b>-8.0</b>

The -5.6 shows a somewhat neutral gloss counteracts the matting effect of the Titanium dioxide.

## Examples 9-12

The chart below shows examples with Starch Structured liquids.

Component	Ex. 9	Ex. 10	Ex. 11	Ex. 12
K Laurate	6	-	6	6
Na cocoyl methyl taurate	3	-	3	3
Lauryl ether sulfate	0	6	0	0
Cocoamidopropyl Betaine	-	3	-	-
Corn starch	10	10	10	10
Structure XL Co-water soluble cross-linked starch	1.5	1.5	1.5	1.5
Glycerin	6	6	6	6
Jaguar C13S	-	-	-	0.4
Merquat 100	-	0.4	0.4	-
TiO2	15	15	15	15
Soft Talc	5	5	5	5
Petrolatum	5	5	0	0
Sunflower seed oil	-	-	-	-
Pig skin in-vitro				
Δ gloss (%)	<b>-21.4</b>	<b>-24.6</b>	<b>-26.4</b>	<b>0.0</b>
L	<b>4.7</b>	<b>21.3</b>	<b>44.3</b>	<b>15.7</b>
A*	<b>-0.5</b>	<b>-5.2</b>	<b>-5.8</b>	<b>-4.23</b>
B*	<b>4.0</b>	<b>10.9</b>	<b>-10.6</b>	<b>-11.0</b>